

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 1, 2015/2016

**PEM0016 – ALGEBRA**  
(PE01-PE05)

8 OCTOBER 2015  
9.00 a.m to 11.00 a.m  
(2 Hours)

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### INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages including the cover page.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of marks for each question is given.
3. Please write all your answers in the answer booklet provided.

**Answer ALL the questions (100 marks).****Question 1 (25 Marks)**

(a) Solve  $3x^{\frac{2}{3}} - 7x^{\frac{1}{3}} + 2 = 0$ . (5 marks)

(b) Use Binomial Theorem to find the term containing  $x$  in the expansion of  $\left(x - \frac{1}{x^3}\right)^5$ . (6 marks)

(c) Solve  $\sqrt{2x-7} - \sqrt{x} - 1 = 0$ . Express your answer using **solution set**. (7 marks)

(d) Solve the inequality and express your answer using **interval notation**.

$$\frac{2x^2 - 10x - 4}{x+1} < 3 \quad (7 \text{ marks})$$

**Question 2 (25 Marks)**

(a) Given function  $f(x) = \frac{1-x}{3+x}$  and  $(f \circ g)(x) = \frac{x+1}{7-2x}$

(i) Express the domain of  $f(x)$  using **solution set**. (1 mark)

(ii) Find the function  $g(x)$ . (5 marks)

(iii) Express the domain of  $(f \circ g)(x)$  using **solution set**. (4 marks)

(b) Given function  $f(x) = 5 + \ln(3x+1)$ .

(i) Determine the inverse function  $f^{-1}(x)$ . (4 marks)

(ii) Determine the domain and range of  $f(x)$ . (2 marks)

(iii) Determine the asymptote of  $f^{-1}(x)$ . (1 mark)

(c) Graph the function  $y = \log_2\left(\frac{x}{5}\right) + 1$  using transformations.

Show each transformation in separate graph.

Label three coordinates and asymptote (if any) in each graph. (8 marks)

**Continued...**

**Question 3 (25 Marks)**

- (a) The factors of a polynomial function  $f(x) = x^4 - x^3 + ax^2 + bx$  are  $(x - 2)$  and  $(x + 3)$ . Determine the value of  $a$  and  $b$ . (6 marks)

- (b) Given a polynomial function  $g(x) = x(x - 2)^2(x + 3)$ .

(i) Determine the real zeros. (1.5 marks)

(ii) Determine the near zero behavior of each zero. (4.5 marks)

(iii) Sketch the function  $g(x)$ .

Label coordinates for all real zeros. (3 marks)

- (c) Find the partial fraction decomposition of  $\frac{3x^2 + 4x + 8}{x^2(x^2 + 2x + 4)}$ . (10 marks)

**Question 4 (25 Marks)**

- (a) Solve the following equations by using **inverse matrix method**. (17 marks)

$$\begin{cases} 3x - y + z = 14 \\ x + 2y - 3z = -19 \\ x + 3y = -7 \end{cases}$$

- (b) Given matrix  $A = \begin{bmatrix} -2 & 0 & a \\ 3 & -2 & 5 \end{bmatrix}$  and matrix  $B = \begin{bmatrix} -9 & 0 \\ 1 & -7 \\ 8 & 6 \end{bmatrix}$ .

The determinant of matrix  $AB$  is equal to 506,  $|AB| = 506$ .

Determine the value of  $a$ . (8 marks)

**End of Paper**